

## **IEM's AI Modeling: Short-term COVID-19 Projections**

**Date: 6/1/21**

Leveraging over 15 years of support to HHS for medical consequence modeling and our proprietary artificial intelligence (AI) models, IEM believes that our Coronavirus model outputs can be used to assist localities and their medical facilities to better prepare for an increase in hospitalizations, to better plan for and locate drive-through testing facilities, and to determine where increased levels of transmission may be occurring.

**We have been refining our AI model over the past month and are confident in its ability to provide accurate 7-day projections that can be used for operational and logistical planning.**

### **AI-based Model Background**

IEM is currently using an AI model to fit data from various sources and project new cases of COVID-19. We do not assume the average number of secondary infections (R-value) stays the same over time. IEM's AI model finds the best R-value over time to evaluate how it changes over the course of the outbreak. The IEM modeling team is running ~11 million simulations to fit each state's data and using the best fit for the R-value to project new cases over the next 7 days. The AI models are executed on a daily basis to evaluate the changing dynamics of the COVID-19 pandemic. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 6/1/21 9 a.m.

**Please provide any feedback or send any questions that you might have to us. We are continually updating and improving the model, so your feedback is critical.**

**Also, if you have more current or refined data for your State, Commonwealth or Territory that you would like IEM to factor in, please let us know.**

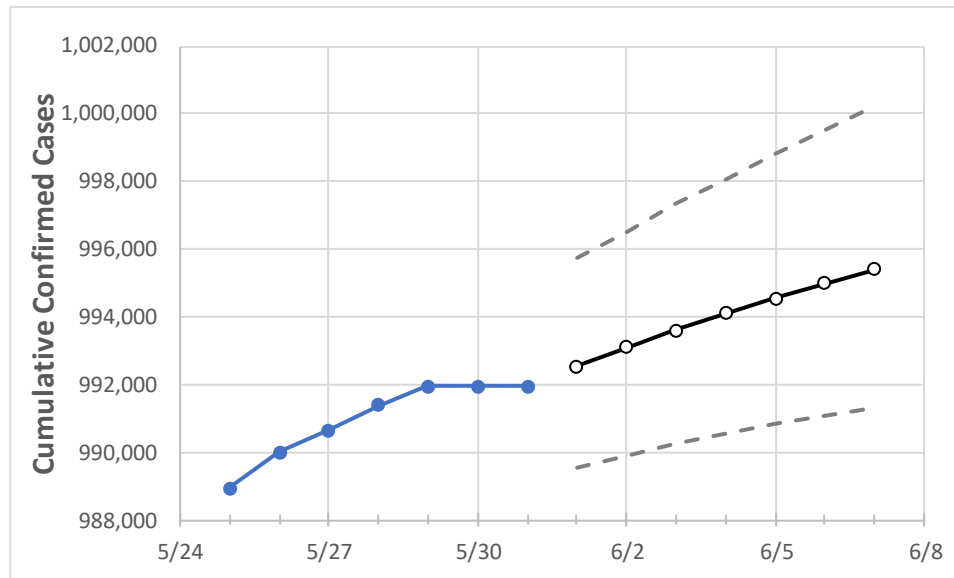
### **IEM's Modeling Lead**

Dr. Prasith "Sid" Baccam is a **Computational Epidemiologist expert** at IEM with more than **20 years of experience in medical consequence modeling and simulation of disease outbreaks** and medical consequences following hypothetical attacks with biological agents or emerging infectious diseases. He develops key simulation models and decision support tools at IEM, specializing in public health, disaster response, and medical countermeasures (MCM) to enhance data-driven decision making and improve modeling assumptions.

Upon receiving his **Ph.D. in Applied Mathematics and Immunobiology** at Iowa State University, Dr. Baccam worked as a Postdoctoral Research Associate at Los Alamos National Laboratory where he focused on researching viral and immunological modeling. After his stint at Los Alamos, Dr. Baccam has served as Task Lead in multiple public health projects have allowed him to develop expertise as a mathematical biologist and a leader on high-performance modeling and simulation teams.

He has worked with state and local public health officials as well as Federal agencies, including **HHS**, the Centers for Disease Control and Prevention (**CDC**), and the Department of Homeland Security (**DHS**). Dr. Baccam has published numerous papers on public health response models and implications on policy and has been invited to participate in workshops and symposiums held by the Institute of Medicine (now the National Academy of Health). His modeling results have been briefed to the **Executive Office of the President** and informed two presidential policy actions.

## Michigan State Projections



	Actual Confirmed Cases On:					Projected Cases For:						
	5/28	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7	
Michigan	991,372	991,941	991,941	991,941	992,537	993,095	993,608	994,108	994,553	994,979	995,395	

Note: The State's projection shows a "best estimate" curve (the solid line with circles) and the dotted lines are the upper and lower estimates around that best estimate. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

## Michigan Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	5/28	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7
Genesee	41,556	41,573	41,573	41,573	41,589	41,605	41,619	41,633	41,645	41,657	41,668
Ingham	24,709	24,732	24,732	24,732	24,745	24,758	24,770	24,782	24,793	24,802	24,812
Kent	72,675	72,717	72,717	72,717	72,781	72,843	72,900	72,954	73,005	73,054	73,101
Livingston	16,612	16,615	16,615	16,615	16,623	16,629	16,635	16,641	16,646	16,651	16,655
Macomb	99,555	99,598	99,598	99,598	99,652	99,702	99,752	99,798	99,843	99,884	99,921
Monroe	15,314	15,327	15,327	15,327	15,338	15,348	15,358	15,367	15,377	15,385	15,393
Oakland	117,716	117,787	117,787	117,787	117,843	117,898	117,950	117,999	118,047	118,088	118,124
Washtenaw	26,369	26,374	26,374	26,374	26,384	26,393	26,402	26,410	26,418	26,425	26,431
Wayne	164,066	164,185	164,185	164,185	164,286	164,384	164,476	164,563	164,643	164,717	164,789

Some recipients of our daily COVID-19 short-term (7 day) projections have requested projections of demand for: hospital bed, intensive care unit (ICU) beds, and mechanical ventilation. We realize that different states and localities will have different characteristics for hospital demand of COVID-19 cases, and we are presenting the best assumptions we could find for those medical demands based on scientific literature and health data reporting. Specifically:

- **Beds:** For hospitalization, we use a range of 10% and 20% of cases require hospitalization based on CDC's report ([MMWR, March 18, 2020](#)) and state reports of COVID-19 cases.
- **ICU:** The CDC report found that 24% of hospitalized cases require ICU care.
- **Ventilators:** Based on clinical data from China and state reports, we assume that 50% of ICU cases require a ventilator.

If you have other estimates for these assumptions, please share them with us as we work to refine our modeling, assumptions, and data on a daily basis.

The medical demands shown in the table assume 20% of **cumulative** confirmed cases require hospitalization. To get the medical demand for the assumption that 10% of confirmed cases require hospitalization, simply divide the demand by 2.

### Michigan Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	5/28	5/29	5/30	5/31	6/2				6/4				6/6			
Genesee	41,556	41,573	41,573	41,573	41,605	(8,321)	[1,997]	{999}	41,633	(8,327)	[1,998]	{999}	41,657	(8,331)	[2,000]	{1,000}
Ingham	24,709	24,732	24,732	24,732	24,758	(4,952)	[1,188]	{594}	24,782	(4,956)	[1,190]	{595}	24,802	(4,960)	[1,191]	{595}
Kent	72,675	72,717	72,717	72,717	72,843	(14,569)	[3,496]	{1,748}	72,954	(14,591)	[3,502]	{1,751}	73,054	(14,611)	[3,507]	{1,753}
Livingston	16,612	16,615	16,615	16,615	16,629	(3,326)	[798]	{399}	16,641	(3,328)	[799]	{399}	16,651	(3,330)	[799]	{400}
Macomb	99,555	99,598	99,598	99,598	99,702	(19,940)	[4,786]	{2,393}	99,798	(19,960)	[4,790]	{2,395}	99,884	(19,977)	[4,794]	{2,397}
Monroe	15,314	15,327	15,327	15,327	15,348	(3,070)	[737]	{368}	15,367	(3,073)	[738]	{369}	15,385	(3,077)	[738]	{369}
Oakland	117,716	117,787	117,787	117,787	117,898	(23,580)	[5,659]	{2,830}	117,999	(23,600)	[5,664]	{2,832}	118,088	(23,618)	[5,668]	{2,834}
Washtenaw	26,369	26,374	26,374	26,374	26,393	(5,279)	[1,267]	{633}	26,410	(5,282)	[1,268]	{634}	26,425	(5,285)	[1,268]	{634}
Wayne	164,066	164,185	164,185	164,185	164,384	(32,877)	[7,890]	{3,945}	164,563	(32,913)	[7,899]	{3,950}	164,717	(32,943)	[7,906]	{3,953}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.